

MEKETA

INVESTMENT GROUP

State Teachers Retirement System of Ohio

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Reference Portfolio Benchmark



Approaches to Total Portfolio Benchmarking

→ There are two complementary approaches; each serving a different purpose:

Reference Portfolio Benchmark

- Used primarily to determine asset allocation success (a Board decision).
- When compared to the Policy Benchmark, seeks to measure the value of additional diversification and/or complexity.
- Requires a long-term (e.g., 10- year) horizon to ensure efficacy and align with investment horizon.
- Needs to exhibit a similar risk posture as the Board-selected asset allocation.

Goal of today



Policy Portfolio Benchmark

- Two varieties:
 1. Static weights (i.e., policy target weights)
 2. Dynamic weights (i.e., actual portfolio weights)
- Compared to the actual portfolio, it can measure the two components of implementation success: asset class weightings and selection within asset classes.
- Over longer-term time periods, it can be compared to Reference Benchmark for asset allocation decisions.

Currently in place





Critical Benchmark Considerations

- In order to serve its role, there are certain characteristics that a benchmark must exhibit.
- The “Bailey Criteria” is commonly used to describe the archetypical characteristics:
 - The following page highlights those characteristics.
- From Meketa’s perspective as it relates to STRS Ohio, one of the most important characteristics is the below:
 - Specified in advance – constructed before evaluation period.
 - For STRS, this implies that we must only examine new benchmarks on a go-forward basis.



Benchmark Characteristics

→ **Bailey Criteria**¹:

- Unambiguous – well-defined identities and weights;
- Investable – one can own the benchmark's constituents;
- Measurable – can calculate performance at reasonable intervals;
- Appropriate – consistent with the investment approach/style;
- Reflective of current investment options – representative of the segment; and
- Specified in advance – constructed before evaluation period.

→ Excluding liquid asset class benchmarks, achieving all of these criteria is near impossible.

¹The Bailey Criteria: Financial Analysts Journal, CFA Institute, 1992.



Additional Considerations of Total Plan Benchmarking

- There is no such thing as a “passive” total plan benchmark.
 - Even when using a simple reference portfolio benchmark (e.g., 60% equity / 40% bonds), the underlying weights are actively selected based on a Board’s risk level.
- No single total plan benchmark encompasses all elements of assessment.
- Even when using a relatively simple benchmark, conclusions can only be assessed over long periods of time (~10+ years).
 - When illiquid asset classes are included in the portfolio, this time horizon inherently increases.
- Understanding the flaws in a given benchmarking approach is just as important as understanding its role.
- All benchmarks are hypothetical and ignore frictions that are required for actual implementations (e.g., transaction costs, rebalancing, taxes, dividend reinvestment, etc.).
- **From Meketa’s perspective, a Reference Portfolio Benchmark for STRS Ohio is a worthwhile endeavor as it can help answer the question “did our approach to diversification help or hurt us?”**



Benchmark Comparison Challenges

→ There are two common challenges that come up when comparing actual results to benchmark performance:

- Universe Relevance (i.e., combination of “appropriate” and “relevant” from Bailey Criteria)
 - Whether referred to as “opportunity cost” or “investable universe”, ensuring that the correct benchmark is used requires knowledge of both implementation and benchmark details.
 - For example, comparing STRS Ohio returns to solely the S&P 500 would be incorrect.
- Time Horizon
 - It is difficult to ascertain accurate conclusions from relatively short time horizons (e.g., 1-year).
 - When investment decisions are made on 10+ year horizons, accurate conclusions from benchmark comparisons only come to fruition over similar horizons.

→ Despite readily available data for benchmark performance, it requires experience and expertise to ensure the comparisons yield worthwhile information.



Benchmark Comparison Challenges

- Meketa has reviewed the recent paper, *“What Happens When STRS’s Investment Performance is Evaluated Using Real Benchmarks”*.
- As STRS Ohio’s Board-retained consultant, it is incumbent on Meketa to provide guidance to the Board on issues that may impact decisions.
- Unfortunately, this paper falls victim to both of the challenges highlighted on the previous page (Universe Relevance and Time Horizon).
 1. Universe Relevance
 - The MSCI World ex. US Index was used for International Equity. This benchmark excludes Emerging Markets Equity, which is a Board-approved allocation within STRS’s Non-US Equity portfolio.
 - MSCI ACWI ex. US Index would be more appropriate, although this would also differ at the margin compared to the Board-approved split between Developed Non-US and Emerging Markets allocations.
 2. Time Horizon
 - The paper focuses on a single fiscal year rather than multiple and longer periods.



Benchmark Comparison Challenges

→ The table below reconstructs the analysis in its original form (“#1”), as well as with a more appropriate International Equity benchmark (“#2”).

- MSCI ACWI ex. US Index was used for International Equity.
- The table also expands the analysis to additional time periods.

As of 6/30/23 (unless FY)	Original Form (#1)	w/ alternative International Equity BM (#2)	STRS Ohio Total Fund (Net)	STRS excess relative to #1	STRS excess relative to #2
FY 2023	11.1%	9.9%	7.6%	-3.6%	-2.3%
FY 2022	-12.5%	-13.3%	-3.7%	8.8%	9.6%
FY 2021	27.9%	28.4%	29.1%	1.3%	0.7%
Trailing 3-yr	7.5%	6.9%	10.2%	2.7%	3.2%
Trailing 5-yr	6.2%	5.9%	8.1%	1.9%	2.2%
Trailing 10-yr	7.1%	6.9%	8.6%	1.5%	1.7%
Trailing 20-yr	7.4%	7.5%	8.3%	0.8%	0.8%

Excluding FY 2023, STRS outperformed either version of this benchmark on a net of fee basis over the two prior fiscal years as well as longer trailing periods.

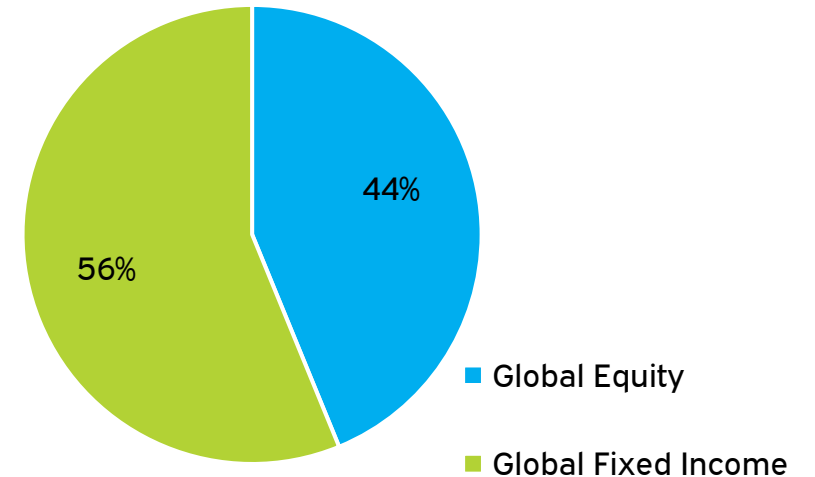
→ This brief review is meant to highlight the care and expertise needed for proper benchmark comparisons.



Passive Definition and Global Market

- A passive benchmark implies that the investable universe is held at market capitalization weights.
 - Market capitalization weights represent the average holding weights of all market participants. This is the foundation of capital market efficiency and related theories (e.g., efficient market hypothesis, CAPM, etc.).
- Passive benchmarks are most applicable for liquid asset classes (e.g., public equity and fixed income).
- For global, multi-asset class investors, the global market capitalization is impossible to define.
- Even if only accounting for public market investments, the global market capitalization weights are not appropriate for long-term investors targeting actuarial rates near 7%.

Estimated Global Market Portfolio*



Expected Return (10-year)**	~5.5%
Expected Annual Volatility**	~9.5%

*Total market capitalizations estimated by 2023 Securities Industry and Financial Markets Association Capital Markets Fact Book – data from Bank of International Settlements and World Federation of Exchanges

**Based on 2024 Meketa Capital Market Assumptions



A Look at STRS Ohio Benchmarks



STRS Ohio Benchmarks

→ The table below details the current Total Portfolio benchmark that is utilized by STRS Ohio.

Asset Class	Policy Weight	Benchmark
Liquidity Reserve	1%	90-day Treasury Bill
Fixed Income	22%	Pro-rata actual weight * Bloomberg US Universal Index Pro-rata actual weight * Bloomberg US Intermediate Treasury Index
Domestic Equity	26%	Russell 3000 Index
International Equity	22%	80% MSCI World ex-US Index (50% hedged) 20% MSCI Emerging Markets Index
Real Estate	10%	85% NCREIF Property Index 15% FTSE NAREIT Equity Index
Alternative Investments	19%	47.4% Cambridge Associates Private Equity and Venture Capital Index 52.6% * Pro-rata actual weight * Cambridge Associates Private Credit Index 52.6% * Pro-rata actual weight * HFRI Fund-of-Funds Composite Index



STRS Ohio Benchmarks – Meketa Takeaways

- In its current form, the STRS Ohio benchmark represents a mixture of both a Static Policy Benchmark as well as a Dynamic Policy Benchmark.
 - This is exclusively due to the partial usage of pro-rata actual weights within the policy benchmark construction.
 - The STRS Ohio Policy benchmark was approved by the Board.
- Because this is only a minor issue, Meketa would recommend maintaining the existing benchmark until the completion of an asset-liability study.
 - Moreover, we would not expect a material difference in historical benchmark returns if solely policy/fixed weights were used instead of pro-rata actual weights.
- As it stands right now, STRS Ohio is not an outlier compared to peers, however, improvements could be made:
 - Utilization of a Reference Portfolio Benchmark ← Goal of today
 - Move to all fixed weights within the Policy Benchmark



Constructing a Reference Portfolio Benchmark



Reference Portfolio Benchmark Design Spectrum

- While reference benchmarks are designed to be “simple,” there is a spectrum of complexity.
- One commonality is that they all seek to measure forms of tradeoffs.

More Basic

More Complex

- Public Equity
 - Public Investment Grade Bonds
- With this approach, a Board seeks to examine if there is any value outside of traditional public equity and fixed income allocations.
- The benchmark effectively breaks the world into “Growth” and “Diversifying” assets and uses the most commonly accepted proxies for each (public equity = growth, fixed income = diversifying).

- Public Equity
 - Public Investment Grade Fixed Income
 - Public Below Investment Grade Fixed Income
 - Public Real Assets
 - Low-cost proxies for other asset classes (e.g., hedge funds)
- With this approach, a Board seeks to examine if the cost/complexity of sophisticated implementations added or detracted value.



Meketa's Recommendation for STRS

→ Meketa recommends that STRS Ohio pursue a Reference Portfolio Benchmark that is as simple as possible and based on three fundamental tenets:

Key Tenet	Implication
For return-seeking assets, STRS Ohio is a global investor that invests across the world.	Reference benchmark should use US, Non-US, and Emerging Markets public equity components.
For diversifying assets, STRS Ohio focuses on USD-denominated assets.	Reference benchmark should use USD-denominated investment grade bonds.
Within asset classes, markets are efficient.	Within asset classes, corresponding indices should be held at market capitalization weights.

→ As a result, the STRS Reference Portfolio Benchmark should be represented as a split of MSCI ACWI (global public equity) and Bloomberg Aggregate (USD-denominated investment grade fixed income) indices.



Constructing STRS Ohio's Reference Portfolio Benchmark

- Reference benchmarks should be constructed with the same forward-looking information as asset allocation decisions are based on.
- For STRS Ohio, these are the capital market assumptions that are utilized within the SIOP and asset-liability study:

	Expected Geometric Return (%)	Expected Volatility (%)
Equity		
Domestic	6.9	17.0
International	7.7	16.7
Alternatives	9.1	17.0
Private Equity	9.9	25.0
Opportunistic/Diversified	7.9	12.1
Fixed Income	4.5	3.7
Core	---	
Liquid Treasury	---	
Real Estate	5.1	13.0
Liquidity Reserve	2.4	1.0
Total Fund	7.04	11.76

The CMAs displayed on the left align with what is shown in the SIOP and are based on *Meketa's 2024 10-year Assumptions*.

Full details (including underlying asset class component weights and correlations) are provided in the appendix.

A Reference Portfolio Benchmark for STRS Ohio should seek to match this expected volatility level.



Reference Portfolio Options

→ For most public pension portfolios, a reference portfolio benchmark with weights of 60-70% equity and 30-40% fixed income aligns with their overall volatility expectations.

		Potential Reference Portfolio Options			
	STRS Ohio Total Portfolio	60% MSCI ACWI / 40% Bloomberg Aggregate	65% MSCI ACWI / 35% Bloomberg Aggregate	67% MSCI ACWI / 33% Bloomberg Aggregate	70% MSCI ACWI / 30% Bloomberg Aggregate
Expected Return*	7.04%	6.41%	6.53%	6.58%	6.64%
Expected Volatility*	11.76%	10.71%	11.48%	11.79%	12.25%

→ For STRS Ohio, a 67% MSCI ACWI / 33% Bloomberg Aggregate mix closely aligns with the volatility expectations of the Board-approved asset allocation.

*Based on 2024 10-year Meketa Capital Market Assumptions



Conclusion

- A Reference Portfolio Benchmark exists as one tool to help answer the question “did our approach to diversification help or hurt us?”
 - The utilization of the Reference Portfolio Benchmark for other purposes (e.g., PBI) is best left to be discussed by compensation experts.
- The asset allocation decision remains a Board decision.
 - A Board ultimately selects the asset allocation with information and guidance by qualified experts.
- Adopting a Reference Portfolio Benchmark will allow STRS Ohio the ability to gauge the success of asset allocation/diversification decisions, but conclusions can only be properly assessed over longer horizons (~10+ years).
- **Meketa recommends that STRS Ohio adopt a 67% MSCI ACWI / 33% Bloomberg Aggregate blend as the Reference Portfolio Benchmark, effective 7/1/2024.**
 - This benchmark will be refined (i.e., new weights) at the completion of the asset-liability study.



Appendix



STRS Ohio Reference Portfolio Benchmark

2024 10-year Assumptions for STRS Ohio (returns, volatilities, correlations)

Weight	Arithmetic Return	Standard Deviation	Asset Class	Cash Equivalents	Investment Grade Bonds	Intermediate Government Bonds	Private Debt	US Equity	Dev Mkt. Equity (non-US)	Dev Mkt. Equity (non-US) (hedged)	Emerging Market Equity	Private Equity	REITs	Core Private Real Estate	Hedge Funds
1.00%	2.41%	1.00%	Cash Equivalents	1.00											
17.00%	4.67%	4.00%	Investment Grade Bonds	0.13	1.00										
5.00%	4.04%	3.00%	Intermediate Government Bonds	0.25	0.85	1.00									
7.00%	10.11%	15.00%	Private Debt	0.04	0.07	-0.25	1.00								
26.00%	8.08%	17.00%	US Equity	-0.09	0.22	-0.12	0.71	1.00							
8.80%	9.01%	18.00%	Developed Market Equity (non-US)	-0.02	0.26	-0.08	0.69	0.88	1.00						
8.80%	8.42%	15.00%	Developed Market Equity (non-US) (hedged)	-0.08	0.11	-0.24	0.60	0.86	0.91	1.00					
4.40%	9.53%	22.00%	Emerging Market Equity	0.00	0.27	-0.05	0.64	0.74	0.86	0.75	1.00				
9.00%	12.32%	25.00%	Private Equity	0.11	0.00	-0.07	0.71	0.90	0.83	0.77	0.79	1.00			
1.50%	7.92%	24.00%	REITs	-0.06	0.36	0.06	0.51	0.76	0.69	0.65	0.59	0.49	1.00		
8.50%	5.41%	12.00%	Core Private Real Estate	0.20	0.25	0.10	0.44	0.40	0.35	0.30	0.30	0.41	0.70	1.00	
3.00%	4.71%	7.00%	Hedge Funds	-0.11	0.12	-0.23	0.74	0.80	0.83	0.80	0.81	0.53	0.59	0.40	1.00



STRS Ohio – Asset Class Component Weights

US EQUITY		INTERNATIONAL EQUITY	
US Equity	100.0%	Developed International	40.0%
		Developed International (hedged)	40.0%
		Emerging Markets	20.0%
LIQUIDITY RESERVE		ALTERNATIVES	
Cash Equivalents	100.0%	Private Equity	47.4%
		Private Debt	36.8%
		Hedge Funds	15.8%
		OPP/DIV	
		Private Debt	70.0%
		Hedge Funds	30.0%
		FIXED INCOME	
		Core Bonds	77.3%
		Liquid Treasury	22.7%
		REAL ESTATE	
		Core Private Real Estate	85.0%
		REITS	15.0%



Background: Standard Deviation and Correlation Assumptions

→ Standard deviation:

- We review the trailing fifteen-year standard deviation, as well as skewness.
- Historical standard deviation serves as the base for our assumptions.
- If there is a negative skew, we increased the volatility assumption based on the size of the historical skewness.

Asset Class	Historical Standard Deviation (%)	Skewness	Assumption ¹ (%)
Bank Loans	6.5	-2.9	10.0
FI/L-S Credit	5.8	-2.7	9.0

- We also adjust for private market asset classes with “smoothed” return streams.

→ Correlation:

- We use trailing fifteen-year correlations as our guide.
- Again, we make adjustments for “smoothed” return streams.

→ Most of our adjustments are conservative in nature (i.e., they increase the standard deviation and correlation).

¹ Note that we typically round our standard deviation assumptions to whole numbers.



STRS Ohio Benchmarks – Bailey Criteria

- The table below maps the STRS asset class benchmarks to the Bailey Criteria. As discussed, it is nearly impossible to fulfill all criteria for all asset classes.
- The STRS Ohio benchmarks fulfill the Bailey Criteria at a similar or higher level than other large-scale public pensions.

STRS Asset Classes	Bailey Criteria					
	Unambiguous	Investable	Measurable	Appropriate	Reflective	Specified in Advance
Liquidity Reserves	X	X	X	X	X	X
Fixed Income	X	X	X	X	X	
Domestic Equity	X	X	X	X	X	X
International Equity	X	X	X	X	X	X
Real Estate	X		X	X		
Alternative Investments	X		X	X	X	



STRS Ohio Benchmarks – Bailey Criteria

→ In the asset classes where the STRS benchmarks fall short of Bailey Criteria, the issues are commonplace among other public pension peers.

Asset Class	Bailey Criteria Shortcomings
Fixed Income	<p><u>Specified in Advance</u> The usage of pro-rata actual weights implies that it is only determined just prior to calculation.</p>
Real Estate	<p><u>Investable</u> NCREIF NPI is not investable.</p> <p><u>Reflective</u> NCREIF NPI solely reflects unlevered, core private real estate.</p> <p><u>Specified in Advance</u> We only know the underlying weights of NCREIF NPI after the fact.</p>
Alternative Investments	<p><u>Investable</u> Cambridge Associates benchmarks are not investable. HFRI benchmarks can be closely mirrored, but they are not directly investable.</p> <p><u>Specified in Advance</u> Neither the Cambridge Associates nor HFRI benchmark weights/constituents are specified ahead of time.</p> <p>The usage of pro-rata actual weights implies that it is only determined just prior to calculation.</p>